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one locality, it is natural to suppose that formerly it had occupied all the intermediate ground, and that the glacier coming through the midst of it had divided it into two groups. He was also unable to understand how M. De Candolle's theory could explain the fact of certain plants growing vigorously in limited spots without extending their area, and was inclined to attribute this limitation to the nature of the rock, its chemical properties, etc., —serpentine, for instance, almost always supports a peculiar vegetation; thus the Engadine Valley, which must have very recently been freed from glaciers, is remarkably rich in rare plants.—M. Tchiatcheff remarked that in Asia Minor he could find no trace of glacial action which could help to explain the distribution of Alpine plants.—*Journal of Botany.*

AMOUNT OF WATER CONTAINED IN THE DIFFERENT PARTS OF A PLANT.—At the same meeting M. Galeznoff gave the result of his researches in calculating the amount of water contained in the different parts of a plant. By dividing a trunk into a number of pieces from the base upwards, he found invariably that the quantity of water increases from the base towards the summit. Of the four species studied by him, he found *Pinus sylvestris* contained most moisture in the trunk, and Acer the least. Betula and *Populus tremula* were intermediate. In Pinus the bark is drier than the wood, and in Acer more moist. In Betula it is drier in the winter and spring, and more watery in summer and autumn. The contrary takes place in the case of the poplar. In the branches the same law holds good but their bases are drier than the portion of the trunk from which they take their rise; and the petioles are more watery than the leaves. In the flowers, the perianth, the filaments and the styles contain more water than the anthers. —*Journal of Botany.*

ZOOLOGY.

RECENT RESEARCHES ON TERMITES AND STINGLESS HONEY-BEES. —The accompanying letter, just received from Fritz Müller, in southern Brazil, is so interesting that it appears to me well worth publishing in "Nature." His discovery of the two sexually mature forms of Termites, and of their habits, is now published in Germany; nevertheless few Englishmen will have as yet seen the account.

In the German paper he justly compares, as far as function is concerned, the winged males and females of the one form, and the wingless males and females of the second form, with those plants which produce flowers of two forms, serving different ends, of which so excellent an account, by his brother, Hermann Müller, has lately appeared in "Nature."

The facts, also, given by Fritz Müller with respect to the stingless bees of Brazil, will surprise and interest entomologists.—CHARLES DARWIN.

"For some years I have been engaged in studying the natural history of our Termites, of which I have had more than a dozen living species at my disposition. The several species differ much more in their habits and in their anatomy than is generally assumed. In most species there are two sets of neuters, viz., laborers and soldiers; but in some species (*Calotermes* Hag.) the laborers, and in others (*Anoplotermes* F. M.) the soldiers, are wanting. With respect to these neuters I have come to the same conclusion as that arrived at by Mr. Bates, viz., that, differently from what we see in social Hymenoptera, they are not modified imagos (sterile females), but modified larvæ, which undergo no further metamorphosis. This accounts for the fact first observed by Lespès, that both the sexes are represented among the sterile (or so-called neuter) Termites. In some species of *Calotermes* the male soldiers may even externally be distinguished from the female ones. I have been able to confirm, in almost all our species, the fact already observed by Mr. Smeathman a century ago, but doubted by most subsequent writers, that in the company of the queen there lives always a king. The most interesting fact in the natural history of these curious insects is the existence of two forms of sexual individuals, in some (if not in all) of the species. Besides the winged males and females, which are produced in vast numbers, and which, leaving the termitary in large swarms, may intercross with those produced in other communities, there are wingless males and females which never leave the termitary where they are born, and which replace the winged males or females, whenever a community does not find in due time a true king or queen. Once I found a king (of a species of *Eutèrmes*) living in company with as many as thirty-one such complemental females, as they may be called, instead of with a single legitimate queen. Termites would, no doubt, save an extraordinary amount of labor if, instead of raising annually myriads of winged males and females, almost all of which (helpless creatures as they are) perish in the time of swarming without being able to find a new home, they raised solely a few wingless males and females, which, free from danger, might remain in their native termitary; and he who does not admit the paramount importance of intercrossing must, of course, wonder why this latter manner of reproduction (by wingless individuals) has not long since taken the place through natural selection of the production of winged males and females. But the wingless individuals would of course have to pair always with their near relatives, whilst by the swarming of the winged Termites a chance is given to them for the intercrossing of individuals not nearly related.

From Termites I have lately turned my attention to a still more interesting group of social insects, viz., our stingless honey-bees (Melipona and Trigona). Though a high authority in this matter, Mr. Frederick Smith, has lately affirmed that "we have now acquired almost a complete history of their economy," I still believe that almost all remains to be done in this respect. I think that even their affinities are not yet well established, and that they are by no means intermediate between hive- and humble-bees, nor so nearly allied to them as is now generally admitted. Wasps and hive-bees have no doubt independently acquired their social habits, as well as the habit of constructing combs of hexagonal cells, and so, I think, has Melipona. The genera Apis and Melipona may even have separated from a common progenitor, before wax was used in the construction of the cells; for in hive-bees, as is well known, wax is secreted on the ventral side: in Melipona on the contrary, as I have seen, on the dorsal side of the abdomen; now it is not probable that the secretion of wax, when once established, should have migrated from the ventral to the dorsal side, or *vice versâ*.

The queen of the hive-bee fixes her eggs on the bottom of the empty cells; the larvæ are fed by the laborers at first with semi-digested food, and afterwards with a mixture of pollen and honey, and only when the larvæ are full grown, the cells are closed. The Meliponæ and Trigonæ, on the contrary, fill the cells with semi-digested food before the eggs are laid, and they shut the cells immediately after the queen has dropped an egg on the food. With hive-bees the royal cells, in which the future queens have to be raised, differ in their direction from the other cells; this is not the case with Melipona and Trigona, where all the cells are vertical, with their orifices turned upward, forming horizontal (or rarely spirally ascending) combs. You know that honey is stored by our stingless bees in large, oval, irregularly clustered cells; and thus there are many more or less important differences in the structure, as well as in the economy, of Apis and Melipona.

My brother, who is now examining carefully the external structure of our species, is surprised at the amount of variability which the several species show in the structure of their hind legs, of their wings, etc., and not less are the differences they exhibit in their habits.

I have hitherto observed here fourteen species of Melipona and Trigona, the smallest of them scarcely exceeding two millimetres in length, the largest being about the size of the hive-bee. One of these species lives as a parasite within the nests of some other species. I have now, in my garden, hives of four of our species, in which I have observed the construction of the combs, the laying of the eggs, etc., and I hope I shall soon be able to obtain hives of some more species. Some of our species are so elegant and beautiful and so extremely interesting, that they would be a most precious acquisition for zoological gardens or large hot-houses; nor do I think that it would be very difficult to bring them to Europe and there to preserve them in a living state.

If it be of some interest to you I shall be glad to give you from time to time an account of what I may observe in my Melipona apiary. — *Nature.*

THE EUROPEAN HOUSE SPARROW. — I regret very much that a naturalist generally so well informed as Dr. Coues, should aid in giving what my own observations compel me to believe to be an altogether wrong statement in regard to the house sparrow, published in the July number of the NATURALIST. Dr. Coues admits that he was prejudiced against the sparrow from the beginning. He expected they would molest our native species; he was always opposed to their introduction, and he is now apparently only too glad to condemn them on the scantiest evidence. I submit that this is too important a question to be thus dismissed, especially by a gentleman like Dr. Coues, who has enjoyed no opportunity of knowing from his own observations whether the opinions he is so free to express are well founded or not.

The statement of Mr. Gentry I entirely discredit. I do not believe that the habits either of the house sparrow or of the robin, blue-bird and our native sparrows are different in Pennsylvania, from what they are in Massachusetts. I believe that if any evil has befallen these birds in Pennsylvania, Mr. Gentry does not assign the right cause and that the house sparrow is innocent. We have the sparrows in Boston in great abundance, and for six years I have day after day, summer and winter, closely watched them. They never molest, attack, or try to drive away any birds, except their own species, and that only from amatory influences. In such times the males are pugnacious against other males of their own species, but nothing more.

The females are not at all pugnacious under any circumstances. In Boston the robin has never been so abundant as it is this summer, and the sparrows certainly never seem so numerous.

They feed together, side by side, and the only molestation the robin experiences is that once in a while a sparrow steals the worm it has dragged from the ground. But the sparrow has to do this slyly, and to drive off a robin would be an undertaking simply absurd.

Then as to the native sparrows. If any one of these seems exposed to being driven off it would be our little amiable chipping sparrow. Before we had their European cousins this bird was hardly known as a visitant to our city. Now they have become abundant, in their season, and what is very remarkable, they seek out and keep company with the European. Any day you please, in summer, you may see the house sparrow and the chipping sparrow feeding together in close proximity and you will never see the former molest or interfere with his confiding companion.

As for the blue-birds, the boot is on the other leg. The blue-birds do molest and drive off the sparrow, and have been known to take possession of and keep boxes put up for and belonging to the sparrow. My friend, John R. Poor, Esq., of Somerville, had succeeded in introducing the house sparrow into his grounds, in the early spring of 1871. They had begun to build in the boxes put up for their homes, when blue-birds appeared and drove them off, and made use of their boxes!

As for the opinion expressed by Dr. Coues that the sparrow is not needed here, that the good they do is overrated, etc., I will not trespass upon your space now by seeking to controvert an opinion so utterly confronted by overwhelming evidence all around us. I will only refer him to the report of the French parliament based upon the most thorough investigations of Prévost, placing the sparrow at the head of the useful birds of France; to the testimony of George N. Lawrence as to their destruction of the measure-worm in New York, Brooklyn, Newark, etc., and to our own city forester of Boston, who can inform him, if he discredits my testimony, how the sparrows here did what man was unable to do in arresting the ravages of the *Orgyia leucostigma.*—THOMAS M. BREWER.

FISH CULTURE IN THE OLDEN TIME.—Most of the popular accounts of artificial fish breeding, and the artificial stocking of rivers with fish, state that this is a very new thing. May I call the attention of the readers of the NATURALIST to the following extract from Kalm's Travels. It will be remembered that at the suggestion of Linnæus, Peter Kalm was sent to North America "to make such observations and collect such seeds and plants as would improve the Swedish husbandry, gardening, manufactures, arts and sciences." He arrived at Philadelphia in Sept., 1748, and left the country early in 1751. He recorded his observations on nearly every conceivable subject, from "the way of eating oysters" and the "art of making apple dumplings" to the most interesting observations on society, politics, agriculture and natural phenomena and productions. The expenses of his trip were paid in part by the government of Sweden, in part by the University of Upsala, by societies and private subscription, Kalm himself contributing to the extent of his ability, "so that at his return he found himself obliged to live upon a very small pittance." I quote from the English translation of his travels, published in London in 1772. After speaking of the diminution of fish in various rivers, caused by "immoderate catching of them at all times of the year" and "the numerous mills on the rivers and brooks" whose dams prevent the fish from passing "up the river in order to spawn," he says (Vol. 1, p. 229):

> "Mr. FRANKLIN told me, that in that part of *New England* where his father lived, two rivers fell into the sea, in one of which they caught great numbers of herrings, and in the other not one. Yet the places where these rivers discharged themselves into the sea were not far asunder. They had observed that when the herrings came in spring to deposit their spawn, they always swam up the river where they used to catch them, but never came into the other. This circumstance led *Mr. Franklin's* father, who was settled between the two rivers, to try whether it was not possible to make the herrings likewise live in the other river. For that purpose he put out his nets, as they were coming up for spawning, and he caught some. He took the spawn out of them and carefully carried it across the land into the other river. It was hatched and the consequence was that every year afterwards they caught more herrings in that river; and this is still the case. This leads one to believe that the fish always like to spawn in the same place where they were hatched, and from whence they first put out to sea; being, as it were, accustomed to it."

He had already said (p. 23) that "*Mr. Benjamin Franklin*, to whom *Pennsylvania* is indebted for its welfare, and the learned world for many new discoveries in electricity, was the first who took notice of me, and introduced me to many of his friends.

He gave me all necessary instructions and shewed me his kindness on many occasions." Here is another item that is of interest. While speaking of New York, and the oysters found there, he goes on (I, p. 187),—"LOBSTERS are likewise plentifully caught hereabouts, pickled much in the same way as oysters, and sent to several places. I was told of a remarkable circumstance about these lobsters, and I have afterwards frequently heard it mentioned. The coast of *New York* had already *European* inhabitants for a considerable time, yet no lobsters were to be met with on that coast; and though the people fished ever so often, they could never find any signs of lobsters being in this part of the sea; they were, therefore, continually brought in great well-boats from *New England*, where they are plentiful; but it happened that one of these well-boats broke in pieces at *Hellgate*, about ten *English* miles from *New York*, and all the lobsters in it got off. Since that time they have so multiplied in this part of the sea, that they are now caught in the greatest abundance."—WM. H. BREWER.

THE INFLUENCE OF THE NERVES UPON THE CHANGE OF COLOR OF FISH AND CRUSTACEA.—A change of color is observed in many fish. It may be rapid and intense, as in the chameleon, but lacking its variety. Pouchet studied this phenomenon in a fish-breeding pond in Concarneau, among species of Blennius, Gobius and Pleuronectidæ. In a former communication to the Academy of Science, Pouchet reported that this change of color of the surface of the fish, corresponding to the color of its surroundings, originated in the brain, and the impression was caused by the action of the surrounding medium upon the retina. With the extirpation of the eyes this power of the animal disappeared. The blinded pleuronectide receives a subdued tint which remains, whatever be the color of the surroundings. This neutral coloring seen upon the entire body may be called a paralysis of the pigment cells. Pouchet tried to prove the influence of the nerves upon the pigment cells in the following experimental manner. Young Pleuronectidæ that changed their color with rapidity were kept in a tank with a brown bottom; before severing the nerve they were put into another tank, the bottom of which was covered with sand; here the specimens operated upon became bleached. Except those portions especially influenced by the nerves, they retained their dark color. By separating the spinal cord no such result was observed. When the trigeminal nerve was severed, all of the pigment cells on that side of the head supplied by it were paralyzed. The animal operated upon, kept in a tank with a sandy bottom, had a faded color, only a small portion of the head remained dark, a smaller or larger portion, depending upon how large a part of the trigemimus was severed. A corresponding result followed the separation of the spinal nerves. The course of the severed nerve was followed by a dark colored stripe; on the back of the pleuronectide, zebra-like lines were seen. The resultless severing of the spinal cord proves, that the influence that a spinal nerve has upon the coloring cells does not proceed from the spinal cord. The splanchnic and sympathetic nerves are then brought into question. The severing of the former gives no result. If on the contrary the sympathetic nerve is severed anywhere on the inferior portion of the vertebral canal, paralysis of all of the pigment cells of the skin occurs, posterior to the cut. The deep position of the fine delicate sympathetic nerve makes it impossible to divide without injuring the neighboring parts. The animal survives the operation two and three days. During this time it is half light and half dark colored. Similar trials made upon the infra-maxillary nerve and artery, both of which lie superficially and are accessible, make it possible that the real nerve stem which regulates the movement of the pigment cells is not the one that accompanies the blood-vessel. Pouchet tried cutting the sympathetic nerve at its origin, behind the articulation of the suspensorium, but with such result as was anticipated. The length of time that the paralysis of the pigment cells lasts, after the nerve is severed, is not fully known; it has been found to remain some weeks as marked as at first. The paralyzed portions upon the surface of the body receive this mixed color, like the blind pleuronectidæ now dark, now light, according as the remaining portion of the skin is influenced by the surroundings. Poisoning the fish with curare, strychnine, morphine, veratria and sontonin has no especial influence upon the change of color.

The influence of habit was marked. A pleuronectide, that had lived a long time in a tank, the bottom of which was covered with sand, when removed to one with a brown bottom, remained four days before it fully received a corresponding color.

Pouchet noted his observations daily, and came to the conclusion that the change of color is at times influenced, but that the origin of the same, is not yet well understood. At certain hours during the day, when it is cloudy for instance, those spots in the operated animals which were in a paralyzed state were scarcely to be perceived, and again in an hour or so later, they stood out in a very marked contrast, in color, to the rest of the skin, without the foundation color having changed.

The power of bringing the color into harmony with the surrounding medium among the crustacea, was remarkably shown in the *Palæmon serratus.* Animals from three to four centimetres long are the best to experiment upon, placed in porcelain vessels with black or white bottoms. The crabs that fishermen bring ashore have a rose or a dark lily color; if they are put into vessels with black or white bottoms in twenty-four hours, they will assume a color wholly unlike each other. Those in the white dish are yellowish, almost colorless, as if they had just shed their skin, and those in the dark colored dish are of a brown red color. When changed the pale one into the dark colored dish, and *vice versâ*, they change color in a corresponding manner. The change of a pale one to a dark color, was more rapid than the reverse. Under favorable conditions we can create a yellow, red and blue Palæmon. If a foot is removed when any one of these colors is present, and put into a solution of sugar, the three colors appear successively before the eye. The microscope reveals the sequel to this. If the pigment cells are pressed together like balls, then they are too minute to mirror themselves upon the retina. As soon as the animal is placed upon a dark ground the coloring cells are distended and send out little branches on all sides; then they become perceptible to the eye. The animal becomes red rose colored, when nothing weakens the lively color of the pigment cells; as the branches of the latter distend under the hypodermis they receive a cobalt color and the carmine of the pigment cells becomes thereby browned, and thus the Palæmon takes on a color corresponding to the foundation. If the coloring cells contract again, the blue remains six or seven hours in the hypodermis and then gradually disappears. With the Palæmon as with fish, the change of color is the result of visual impressions.

Among animals whose eyes Pouchet extirpated, a continuous dark color was observed and continued during the entire time, thirty-four days. By severing the nerves, an explanation of the phenomena was not attained.

Pouchet adds in conclusion, that in the eyeless crustacea, the pigment cells are wanting.— (*Translated* by Dr. Mary J. S. Blake *from Schmidt's Jahrbücher*, *No.* 9, 1872).

The Cotton Worm.—I have already shown that this insect is first described and named scientifically by Hübner in 1822, as *Aletia argillacea* from Brazil. It is an inhabitant of more southern latitudes than the cotton belt of the Southern States. I have shown that the insect is found during the winter as a moth, not from " analogy," but fact. I have also shown that the insect dies out in the central and northern portions of the cotton belt every year, and is replaced the succeeding year by immigration from more southern localities, and where the cotton plant is perennial. Prof. Glover's observations on the moth seem to me to be generally correct and reliable; on the other hand, Prof. Riley's remarks in the Sixth Missouri Report are, where Prof. Glover is contradicted, a " too hasty generalizing," and show nowhere any original acquaintance with the subject. The moths have been collected by Prof. Packard on an island in Salem harbor, Mass.; and by Mr. Burgess in Massachusetts Bay, flying over the water, and by myself about Buffalo, N. Y. The worm never attacks the young cotton in Central Alabama in the spring or early summer, but appears at its earliest at the end of June, and is invariably preceded by flights of the adult moth. Since in Central Alabama insect life begins as early as March (and before then the " hybernated" cotton moth has disappeared) what is the *Aletia argillacea* doing between that date and July, when the worm appears? And why is the young cotton not attacked in May by the worms from the eggs deposited by the "hybernating" moths? If the "hybernating" moths lay eggs, their progeny perish from lack of food. But many chrysalides are killed by frost, and there is great irregularity about the completion of the final brood of moths arising from the age of the insect and the approach of the winter.—A. R. Grote.

Larvæ of Anopthalmus and Adelops.—The larvæ and pupa of Anopthalmus, from Salt cave near Mammoth, were discovered in May last by Mr Sanborn and myself while engaged in exploring the caves of Kentucky under the auspices of the Geological Survey of Kentucky. The larvæ of Anopthalmus were found running under stones on the sand in damp situations in company with the beetles, while the pupæ were found lying in little oval holes in the same situation and at the same date. The larva is more closely allied to that of *Pterostichus nigrita*, figured by Schiödte, than any I have seen figured. The body, however, is rather slenderer, the head much longer and narrower, and the mouth parts longer, while the caudal appendages are shorter. The end of the body is like that of Harpalus and Stenolophus as figured by Schiödte, but the form of the mandibles is more like that of Harpalus. There are no eyes, and the body is white and soft, not chitinous as in Carabid larvæ generally. There is no sculpturing on the head or thoracic segments.

The larvæ of *Adelops hirtus* has a body somewhat like that of Agathidium, but the head is very much larger and as wide and long as the prothoracic segments. It is white, and I can perceive no eyes. The body tapers rapidly from the prothorax to the end, and is provided with long hairs. The antennæ are large and long. The larvæ of these beetles have not yet been discovered in Europe. —A. S. Packard, Jr.

New Variety of Blue Grosbeak.—Several Mexican examples of *G. cœrulea* examined, uniformly differ from the United States bird in the following particulars: they are larger; wing 3·70 instead of 3·40, tail 3·00, as against 2·70; total length about 7·00. The bill, in particular, is notably larger every way, and especially deeper, with a more swollen upper mandible and more curved ridge. Length of culmen 0·70, extreme depth about the same; in *G. cœrulea*, culmen 0·60, depth decidedly less. It is mostly light brownish horn-color, instead of mostly blackish. I see no difference in the plumage. This appears to be the resident Mexican form, and to be quite as "good" a variety as many of those now current. It may be termed *G. cœrulea* var. *eurhyncha*.—Elliott Coues.

Dimorphism in Gall Flies.—Mr. H. F. Bassett (Canadian Entomologist, v, 91) states that *Cynips q. operator* is double brooded; thirty of one brood of females ovipositing in the buds of the oak, and again some of a second brood ovipositing in the young acorns of *Quercus ilicifolia*. From these and other facts he infers " that all our species that are found only in the female sex are represented in another generation by both sexes, and that the two broods are, owing to seasonal differences, produced from galls that are entirely distinct from each other." This confirms Walsh's discovery of dimorphism in the Cynips (see Amer. Ent. ii, p. 320).

SWEET SCENTED ANTS.*—I have just returned from Mr. A. J. Lauderdale's, where I had been on a visit of inquiry in reference to the sweet ants. The whole family were present, and all declare that they have often smelt them, when by accident, in their nocturnal visits, one would get crushed under foot. They have also captured them and smelt their sweet perfume when crushed between the fingers. Capt. Lauderdale states that the odor which the ants emitted on being crushed surpassed in sweetness any perfumery he had ever seen; that he had repeatedly searched for them since he evacuated the place, without success; that the horticultural ants had, since the house was left unoccupied, filled up the fireplace with bushels of sand; and gave it as his opinion that they had driven off the fragrant ants. My son examined them and pronounced it the sweetest odor he had ever experienced.

These ants are extremely rare, but that they do exist there is but little doubt.—GIDEON LINCECUM, *Long Point*, *Texas*.

ROBBER ANTS.*—Once upon a time there dwelt in my yard a flourishing colony of the very smallest species of black ant. The servants about my cook house had spilt a quantity of syrup which run through the floor. The little ants had found it, and seemingly the entire population were out and busy packing it away to their home.

The microscope showed that they carried the syrup in their abdomen. But before they had secured all the syrup, I observed there was great excitement along their road. The larger, black, erratic ants had discovered them while carrying home the syrup, and were taking it away from them. It was really painful to observe the ruthless manner in which they slaughtered and robbed the helpless little ants of their distended sacks of sweetness.

They grabbed up the heavily burdened little fellows, doubled them, and, biting open the abdomen, drew out the full sack and seemed to swallow it; then, casting the lacerated carcass aside, they furiously sprang upon another of the panic-stricken crowd and repeated the horrid operation. Millions of these heartless butchers were at work; and soon, *on account of their wealth*, that populous city was exterminated.—G. LINCECUM.

ICHNEUMON PARASITES OF ANTHRENUS LARVÆ.—We have received from Mr. E. S. Cassino two small ichneumon larvæ found on July 30th in that of the Anthrenus. We are not aware that this destructive museum pest is known to be thus affected.

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*Communicated in a letter to the Smithsonian Institution, and published by permission of Professor Henry.

LARVÆ OF MEMBRACIS SERVING AS MILK CATTLE TO A BEE.—Fritz Müller has observed in Brazil a larva of a leaf-hopper (*Umbonia indicator* Fairm.) which is used, like the Aphides by the ants, as milch cattle by a species of stingless bee (*Trigona cagafogo* Müll.) This bee is fond of oily matters, and feeds on carrion, old stinking cheese and oil secreted by various plants. Although stingless, it possesses a very intense venom, which causes a most lively irritation in the skin.

ANTHROPOLOGY.

A TRUE GEOGRAPHY OF THE BRAIN.—It has until lately been supposed that the convolutions of the cerebrum are entirely concerned in purely intellectual operations, but this idea is now at an end. It is now evident, from recent researches, that in the cerebral convolutions—that is, in the part of the brain which was believed to minister to intellectual manifestations—there are nerve-centres for the production of voluntary muscular movements in various parts of the body. It has always been taught that the convolutions of the brain, unlike nerves in general, cannot be stimulated by means of electricity. This, although true as regards the brains of pigeons, fowls, and perhaps other birds, has been shown by Fritsch and Hitzig to be untrue as regards mammals. These observers removed the upper portion of the skull in the dog, and stimulated small portions of the exposed surface of the cerebrum by means of weak galvanic currents, and they found that when they stimulated certain definite portions of the surface of the convolutions in the anterior part of the cerebrum, movements are produced in certain definite groups of muscles on the opposite side of the body. By this new method of exploring the functions of the convolutions of the brain, these investigators showed that in certain cerebral convolutions, there are centres for the nerves presiding over the muscles of the neck, the extensor and adductor muscles of the forearm, for the flexor and rotator muscles of the arm, the muscles of the foot, and those of the face. They, moreover, removed the portion of the convolution on the left side of the cerebrum, which they had ascertained to be the centre for the movements of the right forelimb, and they found